AMENDMENT E
(37 C.F.R. 1.116)

IN THE SPECIFICATION:

Please amend the specification in accordance with 37 C.F.R. 1.121.

On page 1, lines 1 and 2, please amend the title;

On page 1, in the first three paragraphs starting on line 3 and ending at line 25;

On page 2, in the six paragraphs starting at line 8 and ending at line 16;

On page 6, in the first three paragraphs paragraph starting on line 1 and ending on line 26;

On page 6, in the paragraph starting on line 33 and ending on line 35;

On page 7, in the three paragraphs starting on line 1 and ending on line 16;

On page 8, in the paragraph starting on line 28 and ending at line 34;

On page 9, in the paragraph starting at line 31 and ending at line 33;

In the paragraphs starting on page 10, line 25 and ending on page 11, line 6;

On page 11, in the paragraph starting at line 13 and ending at line 31;

On page 12, in the paragraph starting at line 3 and ending at line 19;

On page 12, in the paragraph starting at line 23 and ending at line 35;

On page 15, in the paragraph starting at line 9 and ending at line 21;

On page 16, in the paragraph starting on line 13 and ending on line 19;

In the two paragraphs starting on page 17, line 29 and ending on page 18 at line 20;

On page 19, in the consecutive paragraphs starting at line 24 and ending on page 20 at line 15;

On page 24, in the paragraph starting on line 7 and ending at line 12;

In the paragraph starting on page 24, line 21 and ending on page 25, line 13; and

On page 35, in the Abstract paragraph.

The affected amended paragraphs are attached herein on separate sheets.

IN THE CLAIMS:

Please amend claims 1, 2, 3, 4, 10, 33, 34, 35, 36 and 42 in accordance with 37 C.F.R. 1.121.

Please cancel claims 11-32, 43-61 without disclaimer to their content and without prejudice to their subsequent reintroduction into this or a future patent application.

The claims are attached herein on separate sheets.

AMENDMENT TO SPECIFICATION

[Deleted material is struck-through and added material is underlined]

On page 1, lines 1 and 2, please amend the title:

APPARATUS AND METHOD ~~**TO INCREASE DENSITY AND ENERGY OF**~~ **FOR PROCESSING** HYDROGEN, OXYGEN, AND OTHER GASES

On page 1, in the first three paragraphs starting on line 3 and ending at line 25:

Hydrogen is emerging as one of the primary alternative fuels for the large scale replacement of gasoline and other fossil fuels via its use as automotive fuel or in fuel cells. However, hydrogen is a fuel with one of the lowest **molecular weights** ~~**specific density**~~ and energy content among all available fuels. In fact, the hydrogen molecule has a **molecular** weight of about two atomic mass unit (2 a.m.u.) and the energy content in British Thermal Units (BTU)[1] per standard cubic foot (scf) of about 300 BTU/scf. By comparison, gaseous hydrocarbons can have **average molecular weights** ~~**specific densities**~~ and energy content up to eight times these values, as in the case of acetylene.

These low values of ~~**specific density**~~ **weights** and energy content have caused serious technological, logistic and financial problems which have prevented hydrogen from replacing fossil fuels on a large scale until now, such as:

1) The low **average molecular weight implying in a low** specific density prevents the automotive use of hydrogen in a compressed form because of insufficient range, or excessively large storage requirements. For instance, gasoline contains about 115,000 BTU per American gallon (g). As a result, the gasoline gallon equivalent of hydrogen is given by 115,000 BTU/300 BTU = 383 scf. Therefore, the equivalent of a 20 g gasoline tank would require 7,666 standard cubic feet (scf) of hydrogen which is a prohibitive number of scf for storage in an ordinary car.

On page 2, in the six paragraphs starting at line 8 and ending at line 16:

This invention resolves the above problems for the use of hydrogen as a fuel by achieving a new form of hydrogen, called for reasons explained below MagH™ hydrogen fuel which possesses ~~**specific density**~~ **an average molecular weight** and energy output bigger than those of conventional hydrogen.

This invention also implies the production of a new form of oxygen, called MagO™ oxygen which also possesses ~~**specific density**~~ **an average molecular weight** and energy content much bigger than those of the conventional oxygen.

On page 6, in the first three paragraphs starting on line 1 and ending on line 26:

It is evident that the new chemical species of magnecular clusters implies an increase of the specific weight of any gas, thus including hydrogen and oxygen. In fact, by denoting the valence bond with the symbol - and the magnetic bond with the symbol x, it is evident that the creation of an essentially pure population of magnecular clusters with the structures (H-H)xH, (H-H)x(H-H), (H-H)x(H-H)xH, etc., have respective **molecular weights** ~~**specific densities**~~ of the order of 3, 4, 5, etc., while the conventional molecular structure H_2 can only have a **molecular weight** ~~**specific density**~~ close to 2, as recalled earlier.

It is then evident that the increase of the **average molecular weight of the gas** ~~**specific density**~~, say, of the order of 5 implies a reduction of tank capacities by 1/5 because each cluster in a gas, whether under a valence or magnetic bond, acts as a single entity for pressure, temperature, etc. It then follows that the required 7,666 scf of H_2 for the equivalent of 20 gasoline gallons are reduced in the preceding example to about 1,500 scf which can be easily accommodated in an ordinary tank of about 3.5 scf in volume at about 4,000 pounds per square inch (psi).

It should be stressed that a 5 time increase of the **molecular weight** ~~**specific density**~~ of the hydrogen directly implies that its energy content is increased 5 folds, from then original 300 BTU/scf to 1,500 BTU/scf. Alternatively, a first empirical way to verify the achievement of a magnecular structure is that of measuring the BTU content of the gas considered per scf because any increase over conventional values is a general indication of the achievement of a magnecular structure.

On page 6, in the paragraph starting online 33 and ending on line 35:

A primary objective of this invention is therefore that of achieving the new chemical species of MagH™ hydrogen fuel with **an average molecular weight** ~~**an average specific density**~~ of about 10. a.m.u.

On page 7, in the three paragraphs starting on line 1 and ending on line 16:

A fully similar situation occurs for oxygen. In fact, the conventional molecule O_2 = O-O has **a molecular weight** ~~**the specific density**~~ of 32 a.m.u. while **clusters** ~~**magnecules**~~ (O-O)xO, (O-O)x(O-O), (O-O)x(O-O)xO, etc. have corresponding ~~**specific densities**~~ **molecular weights of** 48, 64, 80, etc. In this case too the creation of a magnecular structure of the oxygen ~~**with 5 times the specific density of the conventional molecular oxygen**~~ reduces its storage size by 1/5-th.

Another primary objective of this invention is, therefore, the creation of MagO™ oxygen with an average **molecular weight** ~~**specific density**~~ which is at least a multiple that of O_2, with a corresponding increase of the BTU content.

Another important feature of magnecular structures is that they imply an increase of the energy release in thermochemical reactions generally bigger than the increase due to the increased **molecular weight** ~~**specific density**~~. This important feature is due to the following three primary aspects:

On page 8, in the paragraph starting on line 28 and ending at line 34:

It is also evident that the same principle outlined above also apply for any other gas, and not necessarily to H and O gases only. In fact, the processing with the apparatus of this invention of any gaseous fossil fuel permits the increase of its **molecular weight** ~~**specific density**~~ as well as of its energy output, thus permitting a consequential decrease of storage tanks, increase of performance and decrease of costs.

On page 9, in the paragraph starting at line 31 and ending at line 33:

It is evident that the experimental detection of H_3 and O_3 provides major credibility for the creation in this invention of H and O magnecular clusters with **a molecular weight** ~~**specific density**~~ greater than 3.

In the paragraphs starting on page 10, line 25 and ending on page 11, line 6:

One embodiment of the invention is an apparatus and method for increasing a ~~specific density~~ **molecular weight** and an energy content of a gas comprising providing a pressure resistant piping system equipped with means for closing and opening said piping system, the means typically being valves; providing means for filling up said piping system with a gas and means for compressing said gas to a desired pressure; providing at least one pair of electrodes placed within said piping system and capable of delivering an electric arc within an interior of the piping system; providing means for delivering an electric power to each of said at least one pair of electrodes; providing means for recirculating said gas through said electric arc; providing means for collecting a resultant processed gas; and filling said piping system with the gas, recirculating the gas through the electric arc generated by the at least one pair of electrodes and collecting the resultant processed gas, wherein the resulting processed gas has ~~a specific density~~ **an average molecular weight** and an energy content bigger than corresponding values of the gas originally first filled into the piping system.

On page 11, in the paragraph starting at line 13 and ending at line 31:

A still other embodiment is an apparatus and method for increasing a **molecular weight** ~~**specific density**~~ and an energy content of a gas comprising providing a pressure resistant piping system equipped with means for closing and opening said piping system; providing means for filling up said piping system with a gas and means for compressing said gas to a desired pressure; providing at least one solenoid acting on a tube or capillary tube in line with said piping system; providing means for delivering an electric current to said at least one solenoid; providing means for cooling said solenoid; providing means for recirculating said gas through said tube; providing means for collecting a resultant processed gas; and filling said piping system with the gas to be processed, compressing said gas to the desired pressure, subjecting said gas to the current of the at least one solenoid acting on the tube while the gas is being recirculated through said tube and with the cooling means activated, and collecting said resultant processed gas, wherein a resulting processed gas has a **molecular weight** ~~**specific density**~~ and an energy content bigger than corresponding values of the gas first filled into the piping system.

On page 12, in the paragraph starting at line 3 and ending at line 19:

The invention also deals with apparatus and a method for producing a hydrogen gas with an increased **molecular weight** ~~**specific density**~~ and an increased energy content comprising providing a pressure resistant vessel filled up with a liquid feedstock rich in hydrogen; providing at least one pair of electrodes placed in such a way to create a submerged electric arc; providing means for delivering an electric power to said at least one pair of electrodes; providing means for collecting a combustible gas produced by said submerged electric arc; providing means for separating a hydrogen content of said combustible gas, the hydrogen content comprising the produced hydrogen gas; and subjecting the liquid feedstock to the submerged electric arc, collecting the combustible gas, and separating the hydrogen content of the combustible gas produced to obtain the resultant processed hydrogen gas, wherein the resultant processed hydrogen gas has a ~~**specific**~~ **molecular** weight and energy content greater than a corresponding value for conventional hydrogen gas.

On page 12, in the paragraph starting at line 23 and ending at line 35:

Another embodiment of the invention is an apparatus and method for increasing the voltage, power and efficiency of a fuel cell comprising operating a fuel cell with a processed gas which has a ~~specific density~~ **molecular weight** and an energy content bigger than corresponding values of an original gas prior to being processed. The processed gas is made by recirculating the original gas in a pressure resistant piping system, by compressing said original gas to a desired pressure, and by subjecting the recirculated original gas to generated electric arcs created by at least one pair of electrodes within an interior of the piping system. The original gas is one of hydrogen and oxygen. The processed gas is MagH™ hydrogen fuel when hydrogen is the original gas and MagO™ oxygen gas when oxygen is the original gas.

On page 15, in the paragraph starting at line 9 and ending at line 21:

The main principle of this invention is therefore that of achieving the magnetic polarization of the orbits of peripheral atomic electrons by flowing gases through electric currents as technologically possible. This principle can be best realized by recirculating the gas through one or more electric arcs. The efficiency of the equipment then depends on the achievement of a sufficiently high Amperes as well as of a sufficiently high operating pressure. The achievement of an essentially pure population of a magnecular structure of a given gas with the desired ~~**specific density**~~ **molecular weight** then requires its recirculation through said electric arc for a period of time depending on the selected gas, the selected current and the selected operating density.

On page 16, in the paragraph starting on line 13 and ending on line 19:

It is also evident that, after completing the processing in the apparatus of this invention, the resulting new species is not composed of all identical magnecular clusters, as it is the case for molecules, but instead of a variety of magnecular clusters from a minimum to a maximum number of atomic components. The ~~**specific density**~~ **molecular weight** of the magnecular gas is then given by the average **molecular weight** ~~**density**~~ of all different magnecular clusters.

In the two paragraphs starting on page 17, line 29 and ending on page 18 at line 20:

According to the above apparatus, the selected gas is continuously flown by pump 11 through Venturis 80 in the immediate longitudinal vicinity of DC electric arcs 20, 21, by therefore exposing said gas to the DC electric arc according to the main principle of this invention. Assuming that the 50 Kwh power unit has 25% loss in the AC-DC rectification, the equipment has 37.5 Kwh of DC electric power available at each arc. Since another principle of this invention is the maximization of the electric current, the arc is operated at about 37 V, thus permitting 1,000 A in each arc. These operating features can be continuously supported by tungsten electrodes. The continuous recirculation of the gas through Venturis 80 for one hour has the following implications: by exposing the atoms to the extreme magnetic fields in the immediate vicinity of the arc, thus polarizing their electron orbits into toroid; aligned polarized atoms as in Fig. 5 bond to each others; and there is the consequential formation of magnecular clusters with the resulting achievement of the desired increase of the ~~specific density~~ **molecular weight** and energy content as illustrated in the experimental evidence outlined below.

The increase in the ~~specific density~~ **molecular weight** and energy content can be achieved in a number of ways, such as: the use of the above described equipment for several hours, e.g., for one full day; the use of AC-DC rectifiers with power much bigger than 50 Kwh; the use of pulse DC power units; the use of a large number of pairs of electrodes sequentially exposed to the same gas flow; a capillary restriction 81 around the electric arcs; and other means, as well as any of their combinations.

On page 19, in the consecutive paragraphs starting at line 24 and ending on page 20 at line 15:

In all cases the advantages in the use of the magnecular clusters of hydrogen fuel and oxygen over the use of conventional gases are numerous. For instance, the use of the magnecular clusters of hydrogen fuel and oxygen as liquefied rocket fuel implies: 1) a reduced cost of liquefaction, evidently due to the increases **in molecular weight** ~~**density**~~ and other factors; 2) an increased energy output; and 3) an increase of the payload or, equivalently, a decrease of the fuel for the same payload. All these advantages evidently depend on the achieved degrees of magnecular structure.

It should be indicated that the apparatus above described is also applicable to conventional gaseous hydrocarbon, such as natural gas, methane, acetylene, etc. In fact, the equipment of this invention can also be filled up with any of these gaseous hydrocarbons and reach the same results, such as an increase of the molecular weight and energy ~~**density**~~. Moreover, it should be noted that, in this particular case, the electric arc breaks down the polymer chains of hydrocarbons (C- H_2)-(C-H2)-(C- H_2)-.... and rearranges then into magnecular clusters (C- H_2)x (C-H)xHx(C- H_2)x(C- H_2)x with the environmental major advantage of turning the original polluting fuels into a clean burning fuel.

It should be finally indicated that this invention is equally applicable to noncombustible gases, such as helium, nitrogen, argon, etc. in which case the dominant advantage is evidently the increase of ~~**specific density**~~ **molecular weight** with consequential decrease of storage volumes, and related logistic advantages. It should be noted that, even though non-combustible, these gases can also store energy via the internal magnetic bonds of the type depicted in Fig. 5, which energy is evidently released under the form of heat whenever the magnecular structure is removed.

On page 24, in the paragraph starting at line 7 and ending at line 12:

1) The ~~**average specific density**~~ **average molecular weights** of ~~**this type of**~~ the processed hydrogen was measured by two independent laboratories which issued written statements that this particular form of processed hydrogen has **an average molecular weight** ~~**the average specific density**~~ of 15.06 a.m.u., while conventional pure hydrogen has the **molecular weight** ~~**specific density**~~ of 2.016, thus implying a 7.47 fold increase **over** ~~**of**~~ the **molecular weight** ~~**specific density**~~ of conventional hydrogen.

In the paragraph starting on page 24, line 21 and ending on page 25, line 13:

3) The same type of processed hydrogen used in the preceding tests was submitted to Gas Chromatographic Mass Spectrometric (CG-MS) tests via the use of a HP GC 5890 and a HP MS 5972 with operating conditions specifically set for the detection of **the clusters** ~~magnecules~~, which are different than those for molecules, such as: a feeding line with the biggest possible section of 0.5 mm diameter was selected (to prevent that large magneclusters are not permitted to enter the instrument because of the use of a micrometric feeding line); the feeding line was cryogenic cooled; the operation of the columns at the lowest admitted temperature of 10 degrees C (to prevent that the column temperature would disintegrate the magnecular clusters); the longest possible ramp time of 26 minutes was selected (to permit the separation of the peaks representing magnecular clusters); and other requirements. The results of this third test are reproduced in Fig. 16. As one can see, by keeping in mind the results of GC-FTIR of FIG. 15, the GC-MS measurements should have shown only two peaks, that for hydrogen and that for methane. On the contrary, these GC-MS tests do confirm indeed the existence of a large peak at about **a molecular weight of** 2 a.m.u. evidently representing hydrogen, but also the presence of a considerable number of additional peaks in macroscopic percentages all the way to **a molecular weight of** 18 a.m.u. It is evident that these latter peaks establish the existence of a magnecular structure in the type of magnecular clusters of hydrogen here studied. Note, in particular, the existence of well identified peaks in macroscopic percentage with atomic weight of 3, 4, 5, 6, 7, 8 and higher value which, for the gas under consideration here, can only be explained as magnecular clusters composed of individual H atoms as well as H molecules in increasing numbers.

On page 35, in the Abstract paragraph:

Apparatus and method for the industrial production of a new form of hydrogen, oxygen and other gases ~~possessing a higher specific density and a greater energy content that its corresponding conventional gas before processing the convention gas through the apparatus~~. The invention includes a pressure resistant piping system filled with a gas compressed to a desired pressure. A ~~submerged~~ magnetic field within the piping system is generated using electric power. The gas is circulated through the electric arc causing the magnetic field. ~~The resultant processed gas is collected and has a specific density and an energy content larger than corresponding values of the gas originally first filled into the piping system.~~